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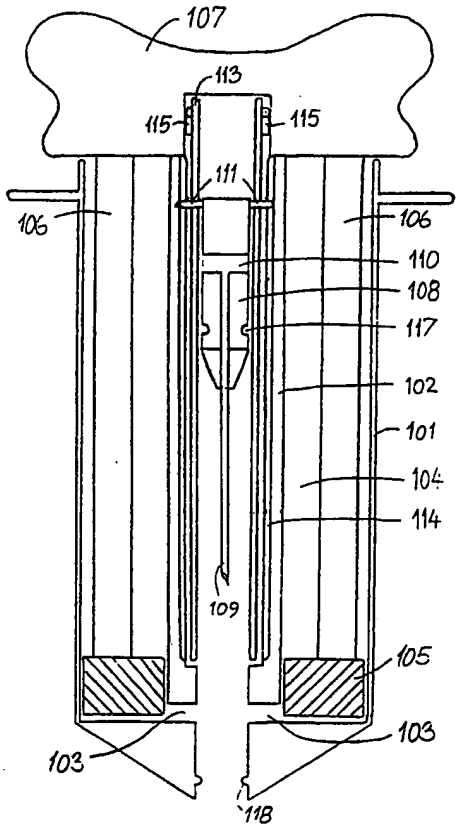
(54) Title: AN INJECTION SYRINGE

(57) Abstract

In the injection syringe of the invention the needle (109) is mounted on a needle housing (108) which is movable in an inner tube (102) coaxial with the syringe housing. A screw movement which displaces the needle housing (108) in the inner tube (102), is performed with the handle (107) of the syringe. Thus, in particular after use, the needle (109) can be withdrawn completely in the syringe with a movement which is independent of the injection movement. Another embodiment is semi-automatic since the piston is spring loaded. This embodiment includes a valve by which the flow can be blocked temporarily, and by which aspiration may be performed for control of the correct position of the needle in the patient. The complete syringe is compact when supplied, and since the needle (109) can be withdrawn completely in the syringe after use, the risk of contacting the needle after injection is eliminated.



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An injection syringe

The invention concerns an injection syringe comprising a cylinder with a piston, which can be moved axially by means of a piston rod protruding from the cylinder top, and with a needle attached to a needle housing axially movable in the cylinder between the cylinder top and the piston such that the needle can assume a retracted position in the cylinder, and with means for retaining the needle guide in both the position of use and the retracted position of the needle.

Injection syringes or corresponding equipment for taking blood samples are nowadays exclusively used as disposable syringes for reasons of safety since the risk of infection involved by repeated use is unacceptably great.

However, the used syringes constitute a risk so that steps have to be taken against injuries caused by the needles until the syringe has been securely destroyed.

Thus, a protecting cap may be fitted over the needle, or the needle may be broken off in a special cutting apparatus.

However, none of these methods is satisfactory since the needle constitutes a danger during the process of applying the cap or breaking off the needle.

Another applied method comprises collecting used syringes in a special container specially used for this purpose. This, however, is an expensive and cumbersome solution since e.g. at a hospital it requires a considerable number of containers.

To remedy these drawbacks and disadvantages it is known from US Patent No. 4 650 468 to mount the needle on a needle housing which may be moved inside the cylinder so that after use the needle can slide completely into the cylinder upon retraction of the piston rod and be retained in this position, so that the cylinder constitutes a protective cap for the needle.

Then the needle no longer constitutes any danger since it cannot be touched, and it can be discarded without further measures.

This solution is an excellent safety measure in many cases, but this known syringe has some serious drawbacks. Primarily, the syringe has to be provided with a protective cap when supplied to protect the needle against damage and to avoid injuries to the users. Further, the lock of the piston rod in the retracted position of the needle in the cylinder constitutes a risk since the piston rod protrudes at the top of the cylinder. Thus, in this position the piston rod may be pressed inwardly when violently manipulating the syringe, so that the lock of the piston rod is destroyed and the needle is pressed out of the cylinder. The syringe can hereby be used again with the consequent serious danger of transmission of diseases.

Finally, of course in particular in case of long needles, this construction entails that the syringe has a considerable length, both in the non-used and in used state.

The object of the invention is to remedy these disadvantages and drawbacks of the known solutions for protection against injuries from needles of disposable syringes. This object is achieved by a syringe as stated in claim 1.

This effectively provides the greatest possible safety against transmission of diseases and injuries as well as reuse of the injection syringe. The piston rod may hereby be inserted into the cylinder also in the retracted position of the needle, so that the non-used syringe may be supplied with both the needle and the piston rod inserted in the syringe housing, thus obviating the need for further protection of the needle, e.g. by means of a sheath or the like. This makes packaging more simple and also entails that the non-used syringe has a smaller length.

Further, extremely simple and reliable operation is obtained since the needle is advanced to the position of use by a rotary movement, while filling and emptying of the syringe are performed in ordinary manner by moving the piston longitudinally of the syringe. These movements are thus independent of each other.

Claim 2 defines an expedient embodiment, entailing that the needle cannot unintentionally be pushed back into the syringe during use.

An injection syringe according to claim 3 may be supplied filled with injection medium as a complete kit, where everything is ready for injection.

When, as stated in claims 4 and 5, the piston is subjected to a spring force, semi-automatic emptying of the syringe is obtained during injection.

Claim 6 defines a particularly expedient embodiment, where injection can be controlled in simple manner.

The invention will be described more fully below with reference to the drawing, in which

fig. 1 shows, partially in section, a non-used packed injection syringe,

fig. 2 shows the syringe in the pulled-out position of the piston rod,

fig. 3 shows the syringe in the advanced position of the needle,

fig. 4 shows the syringe during liquid filling in dotted line and during injection in solid line,

fig. 5 shows the syringe in the retracted position of the needle as well as the piston rod,

fig. 6 shows the syringe in its telescoped position with a needle locked in its inserted position,

fig. 7 is a sectional view of a second embodiment of a syringe in a packed non-used state,

figs. 8 and 9 show part of the syringe of fig. 7 in perspective and partially sectional view,

figs. 10-12 are sections through parts of the syringe of fig. 7,

fig. 13 is a longitudinal section through a third embodiment of the invention, and

figs. 14-17 are sections through the embodiment of fig. 13.

The first embodiment is shown in figs. 1-6. The syringe is constructed with a ring-shaped cylinder chamber between two concentric cylinder walls 1, 2, which are closed at

one cylinder end with a bottom 3 with a central opening 26 through which a needle 18 may be ejected.

A piston 4 with sealing rings 5 along the outer side is inserted in the ring chamber. The lower side of the piston has attached to it a plurality of piston rods 6, in the shown example four, which are provided on their internal side near the piston 4 with two pawl grooves 7 and 8 and with further pawl grooves 9 at the opposite end.

At the end protruding from the cylinder all piston rods 6 are secured to a finger grip 25, which is used for axial as well as rotary movement of the piston rods.

A guide arm 11, upwardly provided with a retaining pin 12, is additionally attached to the finger grip 25.

A needle housing 17, upwardly carrying the needle 18, is mounted inside the central channel. About the root of the needle is mounted a cone 27 which may engage the opening 26 of the cylinder bottom 3, as shown in figs. 3 and 4, so that the needle in ejected position will remain squeezed in the opening 26.

Other releasable retaining means or devices may be used instead of this securing of the needle housing.

Further, the needle 18 may be provided with a lateral liquid inlet 19 and a movable closure 20 for it.

Moreover, the side of the needle housing 17 is provided with two axially extending guide grooves 14 and 15 for the guide arm 11 and the guide rib 13 secured to the cylinder wall 2, respectively.

The needle housing guide groove for the arm 11 is moreover provided with a transverse groove and a retaining groove 16 for the retaining pin 12, as shown in figs. 2, 3 and 5.

Finally, the outer side of the inner cylinder wall 2 is provided at the end with a transverse retaining pawl 10 for cooperation with the pawl groove 9 on the piston rod as well as one or more locking pins 21 extending obliquely upwardly towards the end to form a slide face inclined towards the cone housing 17. These locking pins 21 are elastic and can snap into recesses 22 in the outer side of the needle housing when the needle is fully retracted, as shown in fig. 6.

The mode of operation will be described now. When supplied, the syringe has the telescoped form shown in fig. 1, it being noted that the needle 18 is completely inserted into the cylinder 1, 2. It is thus not possible to touch the needle. A rubber membrane (not shown) can be mounted in generally known manner over the opening at the retaining ring 26, which the needle can penetrate when ejected.

When the syringe is to be used, the finger grip 25 is pulled out, as shown in fig. 2, and is rotated, causing the retaining pin 12 to engage the retaining groove 16 in the needle housing 17.

The finger grip 25 is then pressed home, as shown in fig. 3, whereby the piston 4 and the needle 18 will likewise be pressed home. The needle housing is retained at the bottom, and the finger grip 25 is rotated, but in the opposite direction so that the retaining pin 12 disengages the retaining groove 16 of the needle housing.

The syringe may now be filled with liquid, as shown in fig. 4, by moving the grip 25 outwardly, the liquid being admitted through the opening 19 at the needle root. The opening 19 may then be closed, and the needle is ready for an injection.

The liquid is discharged in ordinary known manner by pressing the grip 25 inwardly, and when the injection has been completed, the grip is rotated again to engage the needle housing 17, following which said housing and the needle are withdrawn into the cylinder, as shown in fig. 5, it being noted that the needle housing is moved further out for locking engagement with the locking pin 21, as shown in fig. 5.

The grip 25 is finally rotated again in the direction of the arrow, thereby disengaging the guide arms 11 from the needle housing so that they can be inserted again, as shown in fig. 6. In this position the needle 18 cannot be touched, nor can it be ejected owing to the effective retaining of the needle housing by the locking pin.

The second embodiment of the invention is shown in figs. 7-12. An inner, cylindrical tube 102 is mounted in a cylindrical syringe housing 101 coaxially with housing, said tube communicating with the syringe chamber 104 at the lower end of the syringe housing through a plurality of radially extending channels 103. A ring-shaped piston 105 is firmly connected via a plurality of piston rods 106 with a handle 107, by means of which the piston 105 may be moved axially in the syringe chamber 104. The inner, cylindrical tube 102 accommodates a needle housing 108 carrying a needle 109. The channel of the needle terminates in the needle housing 108 in a plurality of radial channels 110. The needle housing 108 has a plurality of radial projections 111 extending, in the shown embodiment,

through longitudinal slots 112 in a movable tube 113 and engaging a threaded portion 114 on the inner side of the inner, cylindrical tube 102. At its top the tube 113 has some projections 115 capable of engaging corresponding means 116 in the handle 107 when the piston is in its inserted position in the syringe chamber.

Upon rotation of the handle 107 the means 116 in the handle engage the projections 115 on the movable tube, which is hereby rotated and owing to its rotation moreover rotates the needle housing 108 because of the engagement of the projections 111 in the longitudinal slot 112 in the tube 113. The radial projections 111 are hereby forced to move in the threaded portion 114 in the inner, cylindrical tube 102, and the needle housing is hereby advanced to its position of use where it is fixed by the engagement of an annular groove 117 in the needle housing 108 with a complementary bead 118.

In this position the radial channels 110 in the needle housing 108 are present opposite the corresponding radial channels 103 in the syringe housing 101, so that the syringe chamber 104 is in flow connection with the needle 109.

The syringe may then be filled in ordinary manner, the piston 105 being pulled back by means of the handle 107, so that injection liquid can flow through the needle 109, the radial channels 110 in the needle housing 108 and the radial channels 103 in the syringe housing 101 and into the syringe chamber 104. Injection is then performed in known manner.

When following completed injection the handle 107 and the piston 105 are again in the completely inserted position, the means 115 and 116 are again in engagement, and upon

renewed rotation in the opposite direction the needle housing 108 and the needle 109 can again be withdrawn completely in the inner, cylindrical tube 102, where a snap lock (not shown) may be provided in the fully withdrawn position, preventing ejection again of the needle and thereby preventing reuse.

To additionally secure the needle housing 108 in its position of use, the threaded portion 114 may include a section where the threaded portion has a very low, optionally no pitch, or even a pitch opposite the rest of the threaded portion. The needle housing 108 is hereby fixed completely in its position of use, and it is particularly secured against being unintentionally pushed back into the tube 102 during use.

Alternatively, the threaded portion 114 may be arranged in the tube 113, and the longitudinal slot 112 may be arranged in the tube 102.

A third embodiment of the invention is shown in figs. 13-17. This embodiment has many points of resemblance to the embodiment in figs. 7-12, and means with the same function in these embodiments are provided with the same reference numerals. Thus, this applies to the syringe housing 101, the inner, cylindrical tube 102 with the threaded portion 114, the syringe chamber 104, the ring-shaped piston 105, the handle 107, the needle 109, the radial projections 111, the longitudinal slot 112 in the tube 113, the annular groove 117 in the needle housing and the bead 118.

In this embodiment the handle 107 can only move a limited distance between two abutments 131 and 132, and the tube 113 is secured to the inner side of the handle 107. Rotation of the handle 107 with the tube 113 causes a needle housing 130, as described above, to be moved downwardly in

the syringe to its position of use. However, the length of the threaded portion is adapted so that the needle housing 130 is only moved incompletely toward its position of use by this screw movement. Then the handle 107 with the tube 113 is pressed home, whereby a valve means 133 capable of moving in the needle housing 130 presses the needle housing 130 home to engage the bottom 134 of the inner tube 102, which is separated from the syringe chamber 104 with injection liquid by the valve means. Two small needle tips 135 extend downwardly at the bottom of the needle housing, and at the mentioned pressure these perforate the bottom 134 to create flow communication from the syringe chamber 104 through the needle tips 135 and a channel 136 in the valve means 133 and to the needle 109.

The ring-shaped piston 105 is on its upper side under the action of a compression spring 137, which in turn presses against the internal underside of the handle 107. When, as described above, flow communication from the syringe chamber 104 to the needle 107 has been established, the spring force presses the piston 105 downwardly, and the injection liquid flows out through the needle.

Air in the system is hereby expelled, and when the first drop of the injection liquid is observed, the pressure on the handle 107 is released, whereby the spring presses the handle 107 with the tube 113 upwardly, and the valve means 113 is pulled back and blocks the flow connection from the small needle tips 135 to the needle 109, since the valve means 133 sealingly engages the inner side of the needle housing 130.

The needle 109 may then be inserted into the patient, and a brief pressure on the handle 107 again creates flow connection from the syringe chamber to the needle, and when the handle 107 is released and the valve means 133 is

thereby pulled back, the valve means 133 will operate as a suction piston owing to its structure, and aspiration will take place through the needle 109. This is particularly advantageous in case of intramuscular injection, where it is to be ensured by visual inspection of the aspired matter that the injection does not take place in a blood vessel.

P a t e n t C l a i m s :

1. An injection syringe comprising a syringe housing with a piston which can be moved axially in the housing by means of a handle protruding from the housing, and with a needle which is retained in the position of use in the syringe housing and is in flow communication with the syringe chamber and which can assume a retracted position in the syringe housing, c h a r a c t e r i z e d in that the syringe chamber is ring-shaped and is inwardly defined by an inner, cylindrical tube, in which a needle housing with the needle attached to it is movable and also guided by a projection on the needle housing in cooperation with both a threaded portion and a longitudinal slot, of which one is present on the inner side of the said inner, cylindrical tube, and the other is present on a displacement means for the needle housing, and that said displacement means may be activated by means of the handle.

2. An injection syringe according to claim 1, c h a r a c t e r i z e d in that in the position of use of the needle housing the threaded portion has a pitch which is significantly lower than or directed oppositely to the pitch of the rest of the threaded portion.

3. An injection syringe according to claims 1-2, c h a r a c t e r i z e d in that the needle housing has means adapted to create the flow communication between the syringe chamber and the needle by perforating a partition during its ejection to the position of use.

4. An injection syringe according to claim 3, c h a r a c t e r i z e d in that the piston is affected by an elastic force.

5. An injection syringe according to claim 4, c h a r a c t e r i z e d in that the elastic force operates between the piston and the handle.

6. An injection syringe according to claim 5, c h a r a c t e r i z e d in that in the position of use the handle is movable between an active position in which a valve means in connection with the handle permits flow from the syringe chamber to the needle, and a stop position in which the valve means blocks the flow.

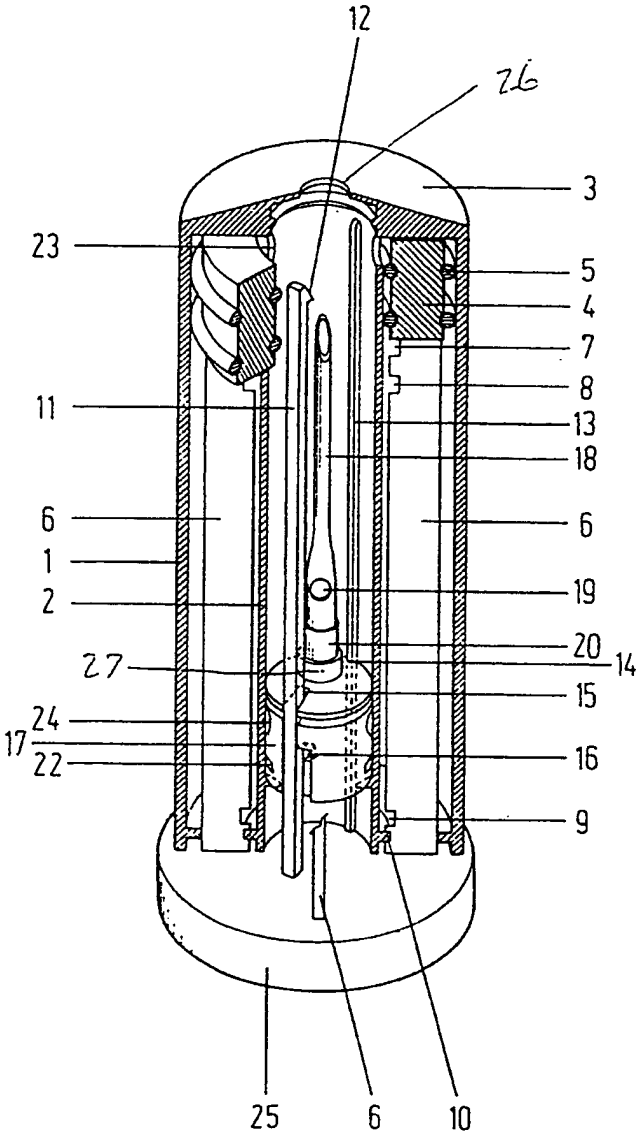

Fig. 1

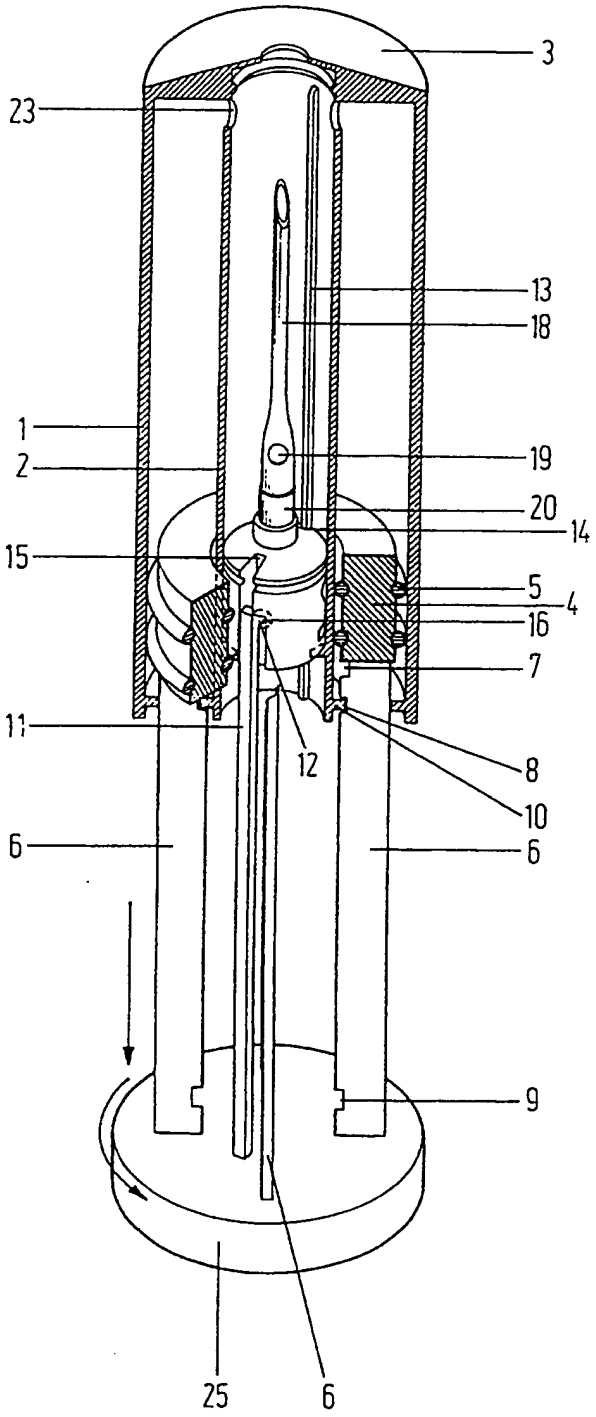

Fig. 2

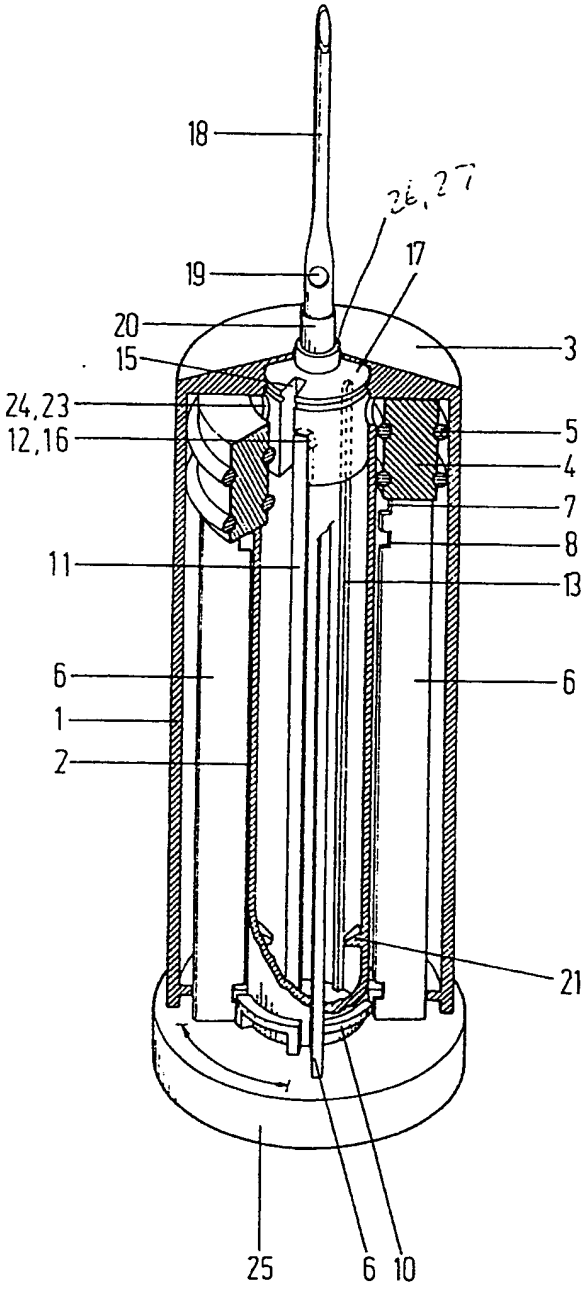

Fig.3

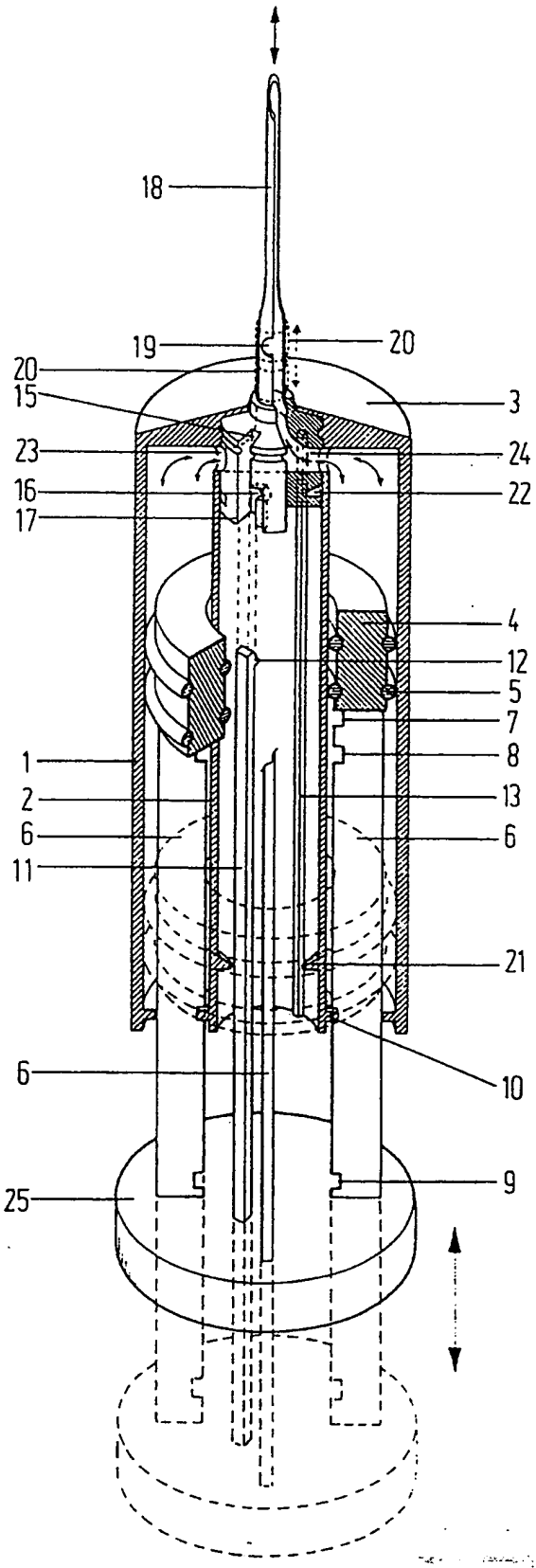

Fig. 4

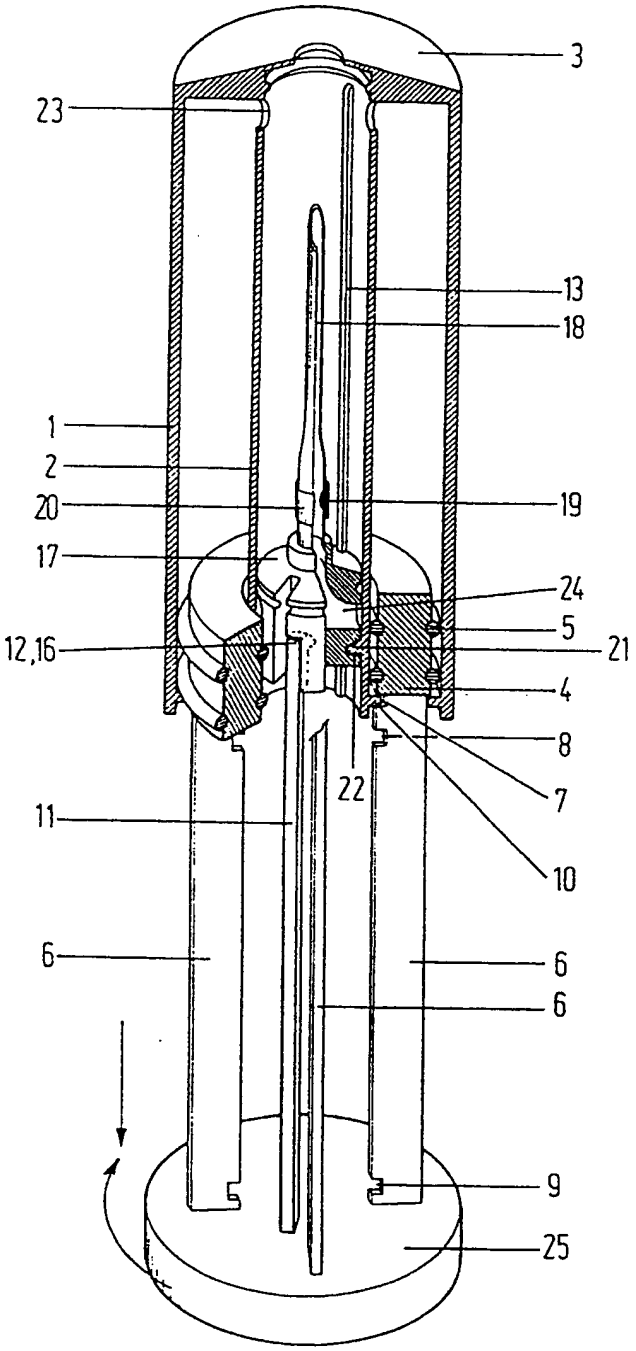

Fig. 5

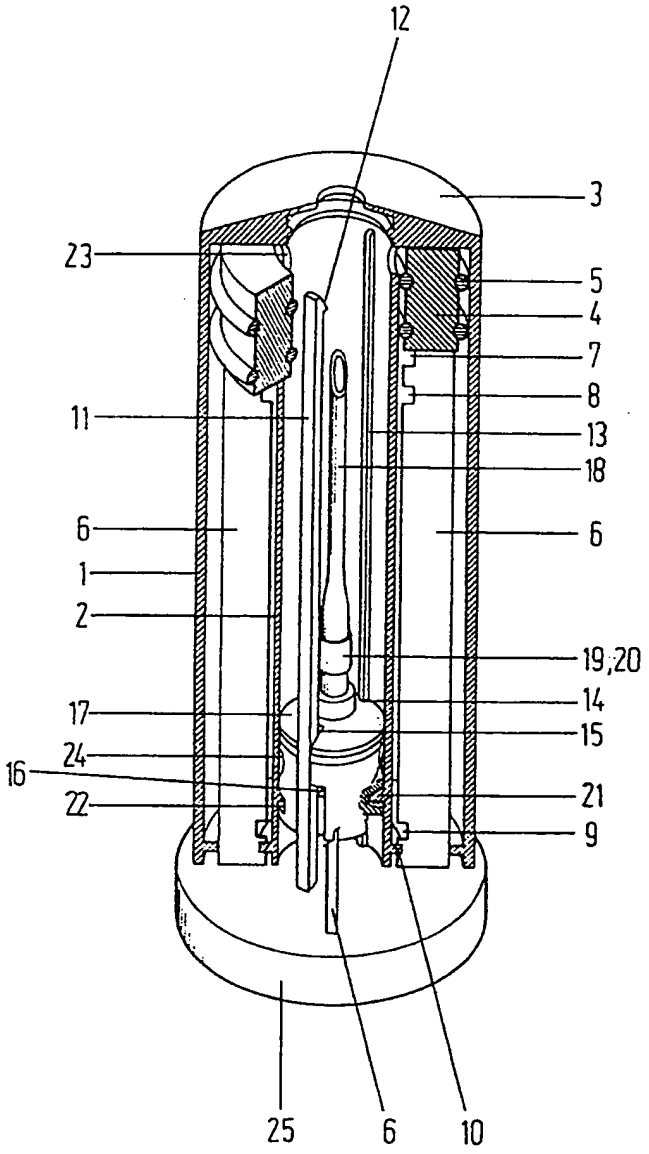

Fig. 6

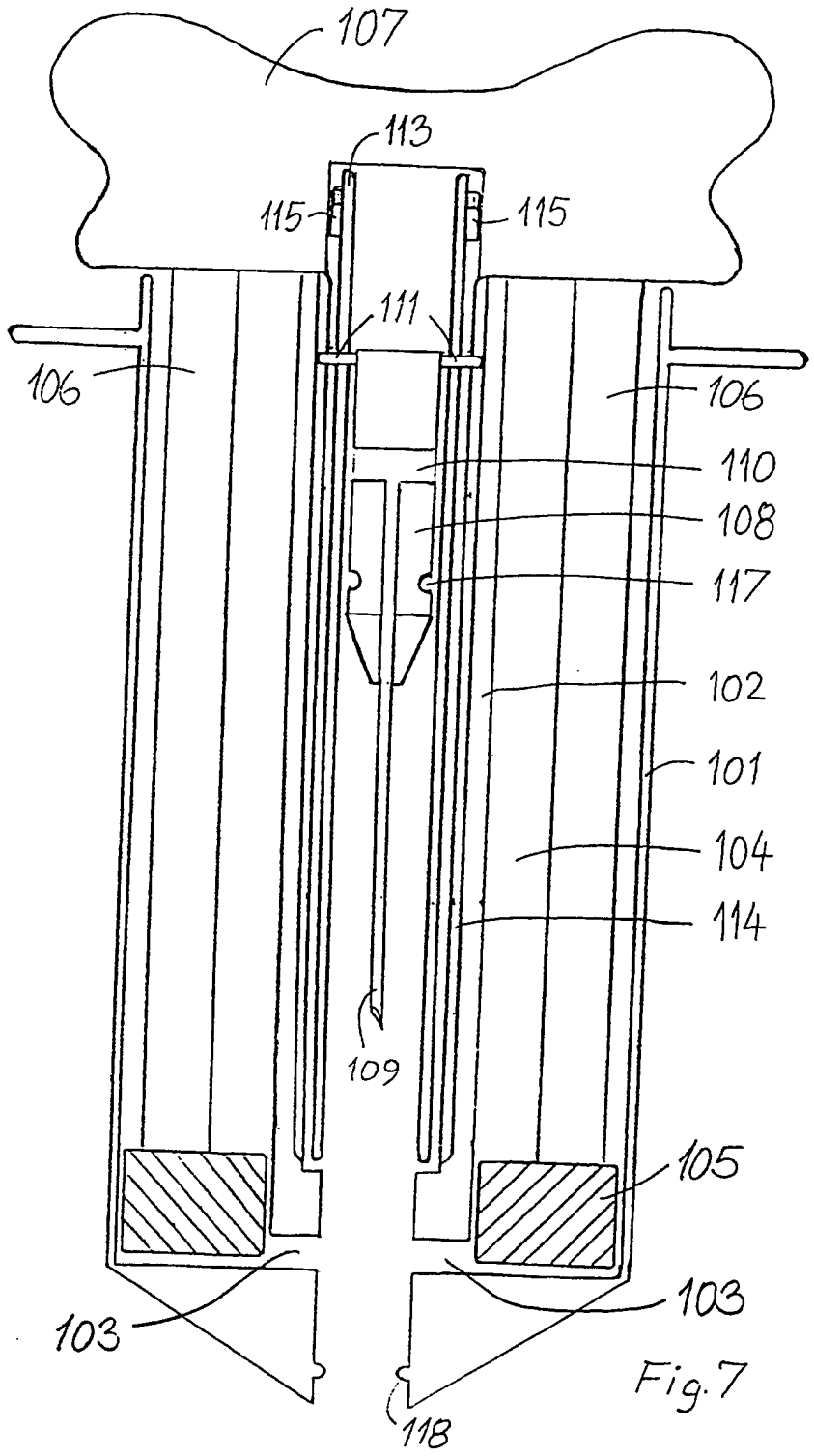
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Fig. 7

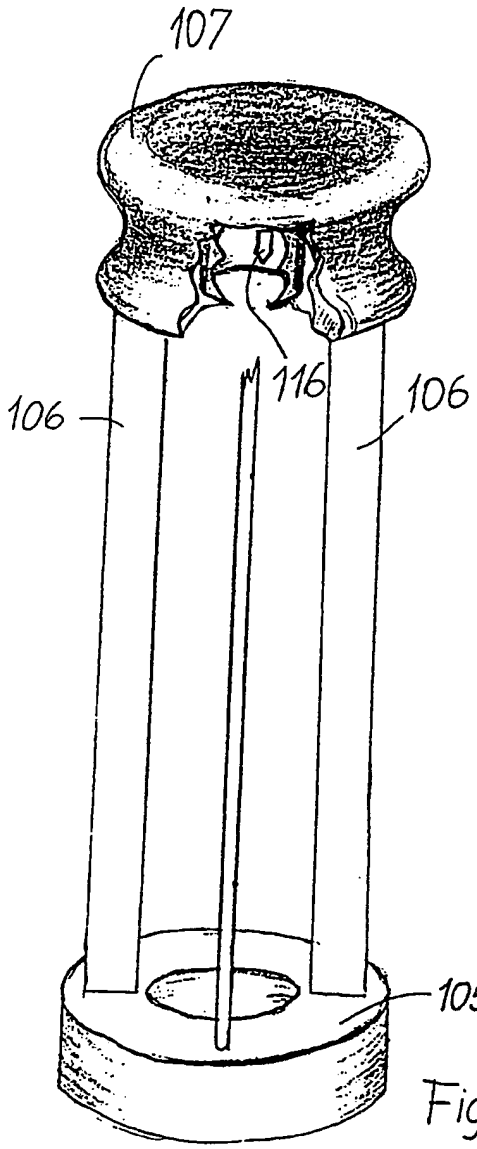

Fig.8

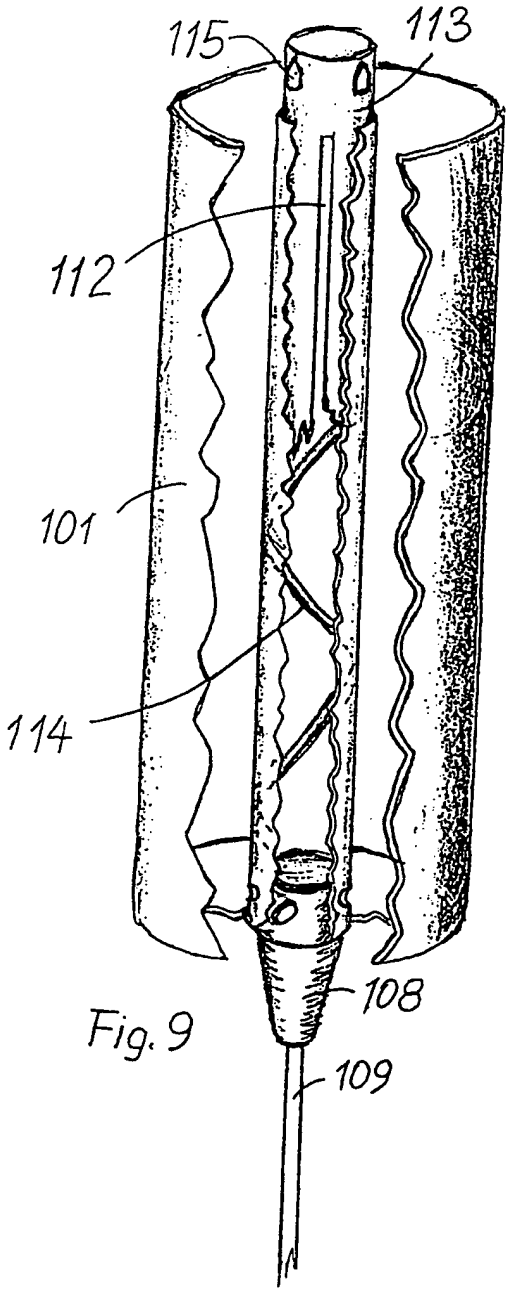

Fig. 9

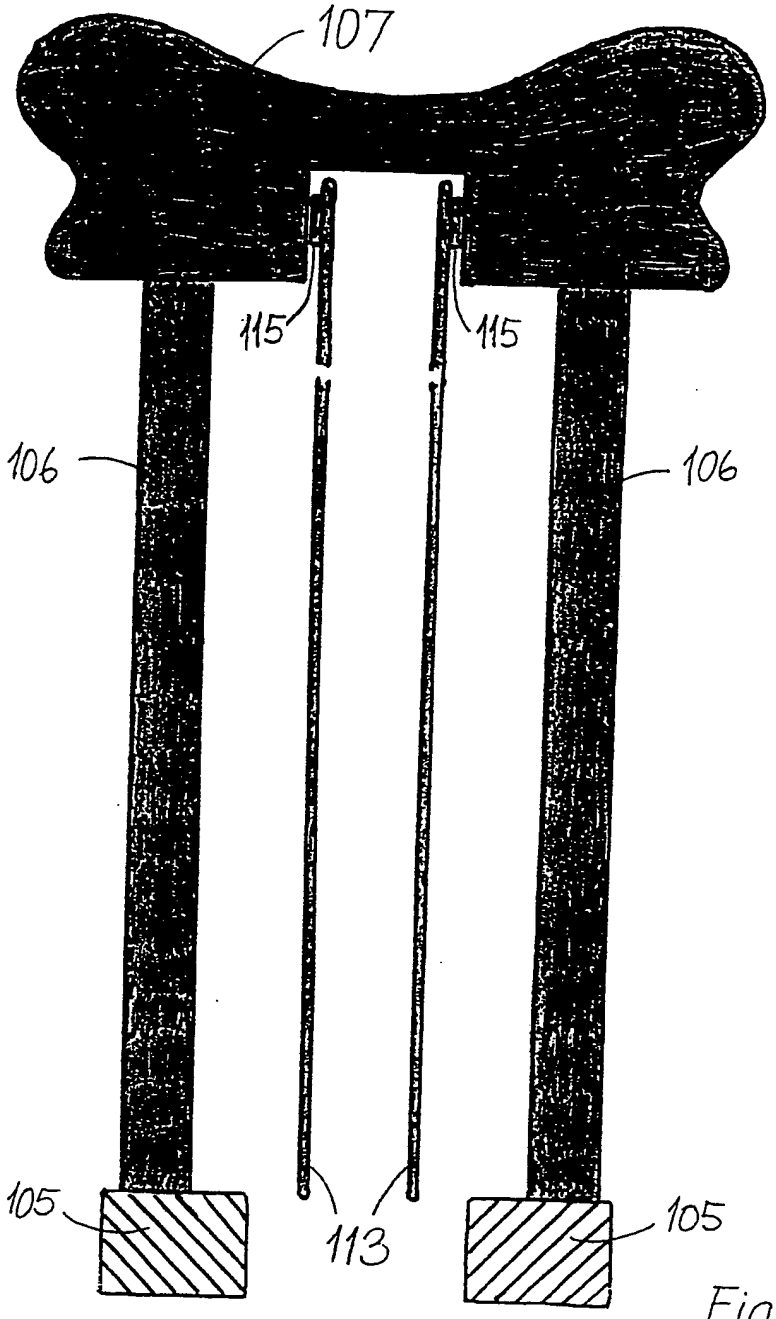

Fig. 10

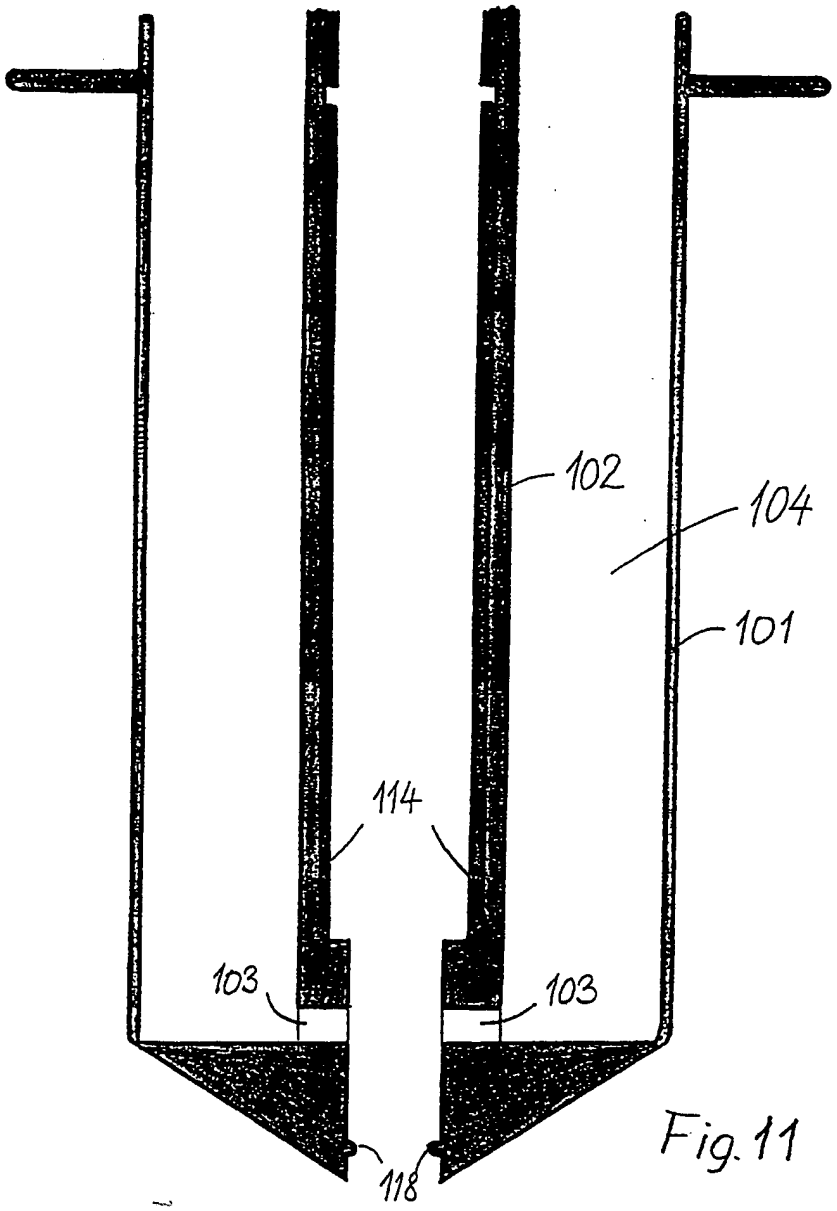

Fig. 11

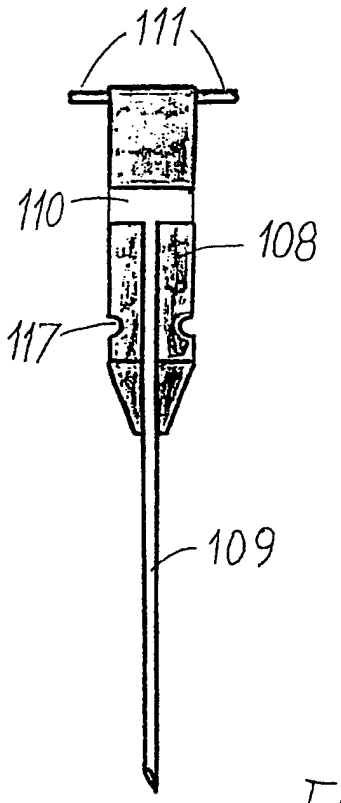

Fig. 12

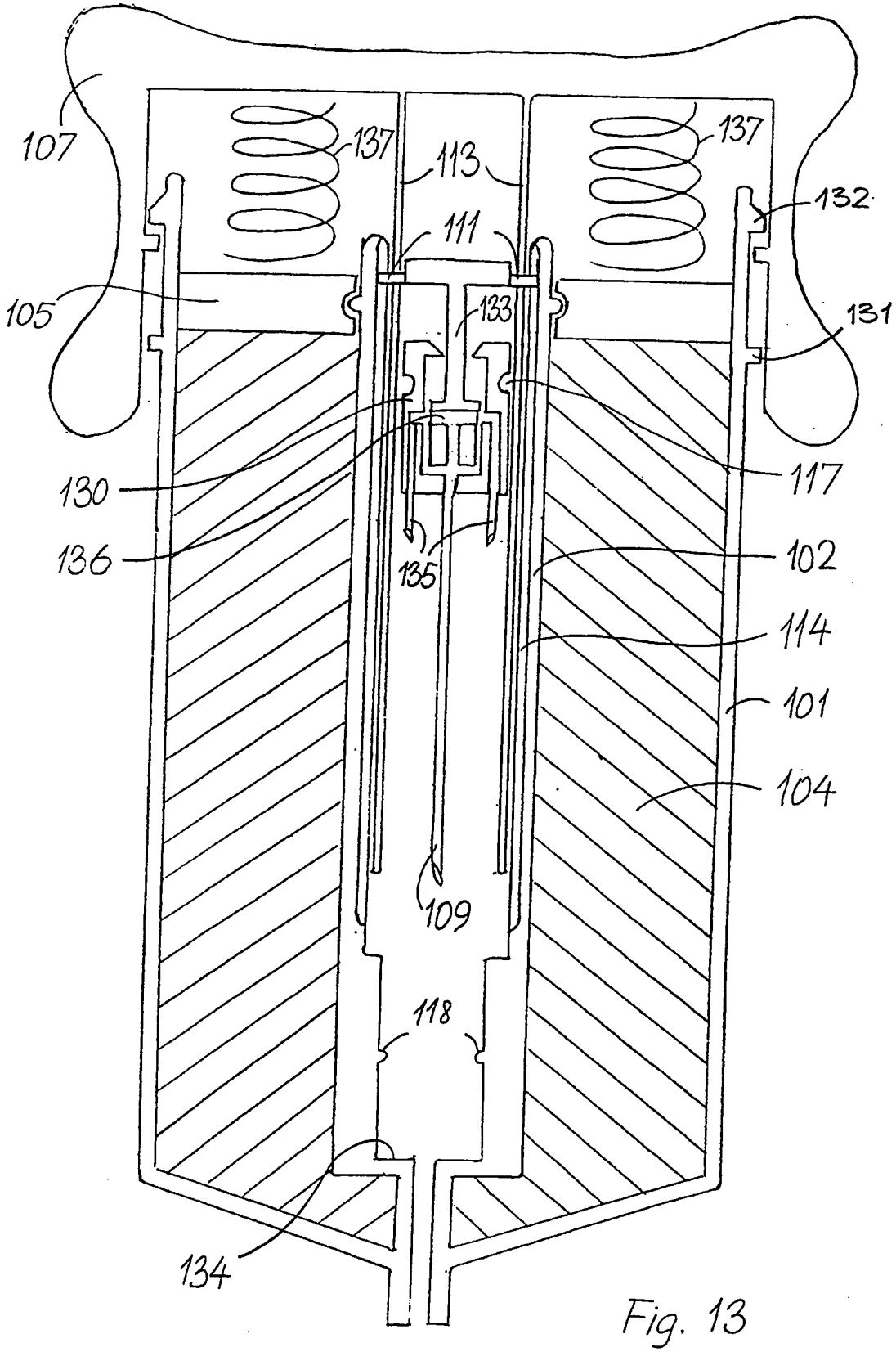
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Fig. 13

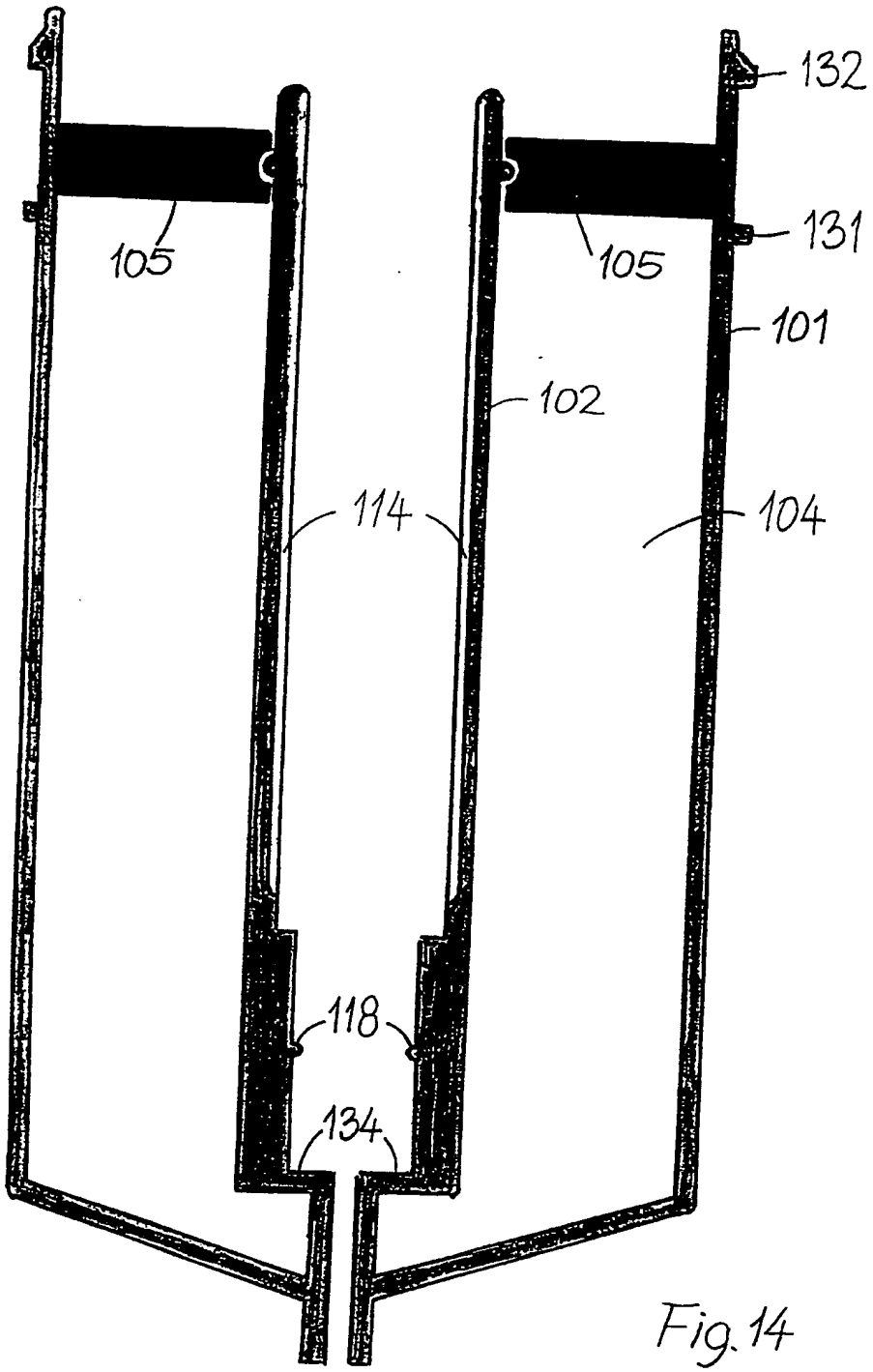

Fig. 14

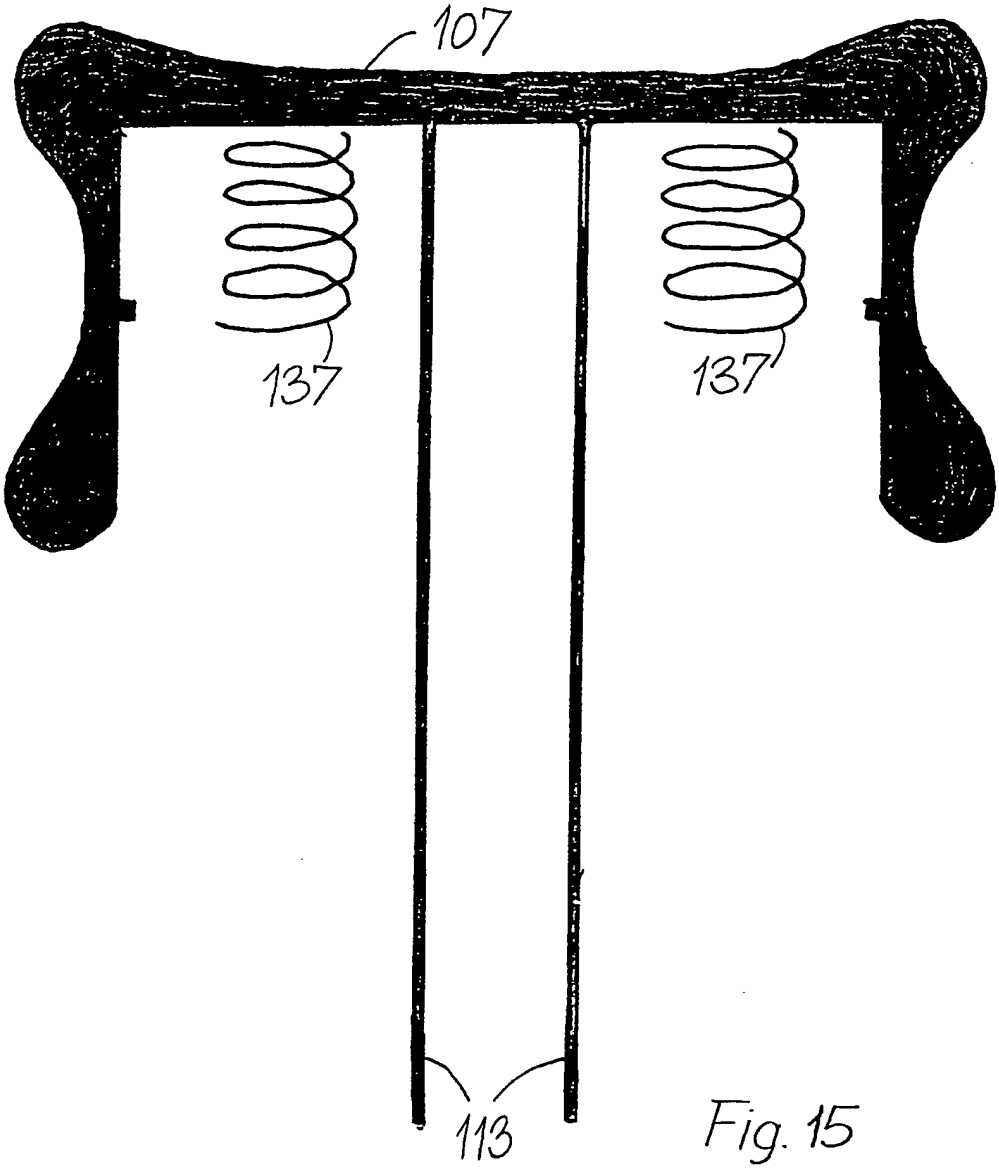

Fig. 15

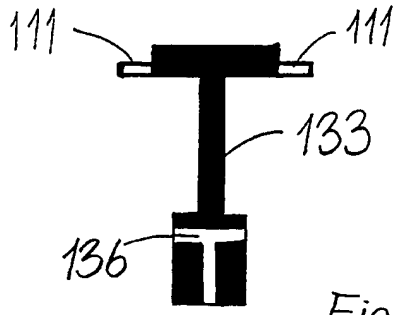

Fig. 17

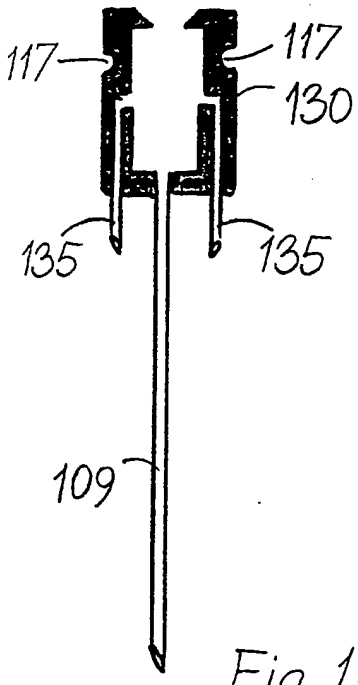

Fig. 16

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 90/00145

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: A 61 M 5/32

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	A 61 M

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
A	US, A, 2722215 (DAHLGREN) 1 November 1955, see the whole document --	1
A	CH, A5, 669910 (MICHEL-ELIE RITZI) 28 April 1989, see abstract; figures A,H --	1
P,A	US, A, 4838869 (ALLARD) 13 June 1989, see abstract; figure 3 --	1
P,A	US, A, 4874382 (LINDEMANN ET AL.) 17 October 1989, see abstract; figure 1 --	1

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* Special categories of cited documents: [10]

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"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
28th August 1990	1990 -09- 11
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Folke Svensson

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/DK 90/00145

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 90-08-02
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 2722215	55-11-01	NONE	
CH-A5- 669910	89-04-28	NONE	
US-A- 4838869	89-06-13	NONE	
US-A- 4874382	89-10-17	NONE	